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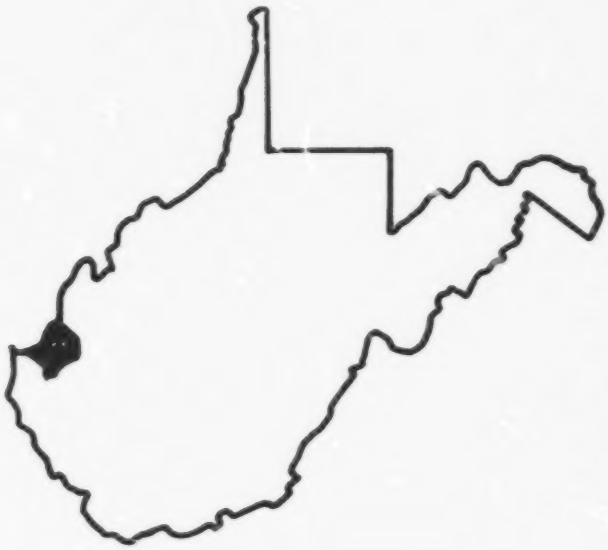
FLOOD INSURANCE STUDY

VILLAGE OF BARBOURSVILLE, WEST VIRGINIA
CABELL COUNTY



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JUNE 3, 1988

COMPLETED

Federal Emergency Management Agency

COMMUNITY NUMBER - 540017

ORIGINAL

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance study purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
VILLAGE OF BARBOURSVILLE, CABELL COUNTY, WEST VIRGINIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Village of Barboursville, Cabell County, West Virginia, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by the Huntington District of the U. S. Army Corps of Engineers (COE) for the Federal Emergency Management Agency (FEMA), during the preparation of the Flood Insurance Study for the unincorporated areas of Cabell County. The work for that study was completed in January 1986.

1.3 Coordination

On July 8, 1986, the Village of Barboursville was notified by FEMA of the initiation of a Flood Insurance Study for the community.

On October 29, 1986, a final Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA and the town to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Village of Barboursville, Cabell County, West Virginia. The area of study is shown on the Vicinity Map (Figure 1).

The Guyandotte River and Mud River were studied by detailed methods for their entire lengths within the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

Big Gut Branch and Tanyard Branch were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

2.2 Community Description

The Village of Barboursville is located in the central portion of Cabell County in southwestern West Virginia. It is completely surrounded by the unincorporated areas of Cabell County.

The village is affected by frontal air mass activity of the continental polar and maritime tropical variety, having frequent, sudden changes. The average high temperature in January is 45 degrees Fahrenheit (^{o}F), while the average low is 26^{o}F. July has an average high of 88^{o}F and an average low of 66^{o}F. Precipitation averages 3.8 inches in January and 4.6 inches in July, with a yearly average of 45.1 inches. The average annual snowfall is 18 inches. The growing season within the community averages six months.

The village lies within the Allegheny Plateau physiographic province. Broad valleys with steep-sided hills characterize the areas along the Ohio River and along the lower reaches of the Guyandotte and Mud Rivers. The upper reaches of the Guyandotte and Mud Rivers have narrow valleys and steep-sided hills that range from 300 to 700 feet above the streambed. Generally, the hilltops are narrow ridges that form divides. A few ridgetops are broad plateau remnants with gentle slopes.

2.3 Principal Flood Problems

Floods can occur in Barboursville during any season of the year. They result from periods of general rainfall over the entire area and from short intense periods of localized thunderstorms common to the region.

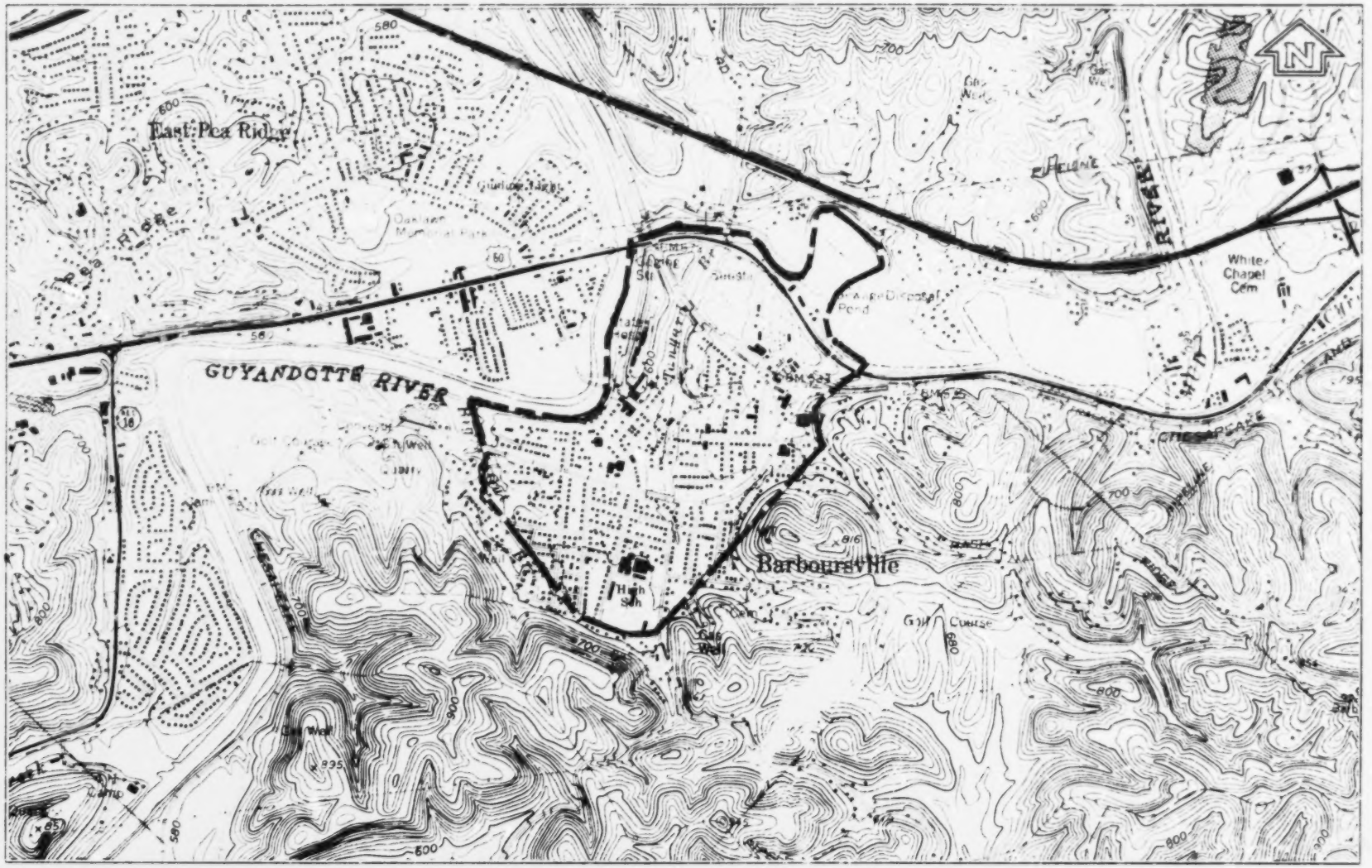

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BARBOURSVILLE, WV
(CABELL CO.)

APPROXIMATE SCALE

2000 0 2000 4000 6000 FEET

VICINITY MAP

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Major floods on the Guyandotte River have occurred in 1934, 1942, 1943, 1948, 1950, 1951, 1962, and 1967. Major floods on the Mud River have occurred in 1884, 1913, 1939, 1942, 1943, 1948, 1950, 1951, 1962, and 1967. The highest flood of record occurred on February 3, 1938, when it reached an elevation of 602.0 feet at the U. S. Geological Survey (USGS) gage in Milton at river mile 24.1.

2.4 Flood Protection Measures

In the Guyandotte River basin upstream from Cabell County, there is one reservoir (R. D. Bailey Lake) that is operated for flood control as well as for other purposes. The information concerning probable future flood levels in this study reflects the reduction in flood heights attributable to this existing reservoir plus an additional reservoir scheduled to be in operation within the next few years.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

Discharges for the Guyandotte River and Mud River were obtained from natural discharge-frequency curves that were based on a regional

analysis developed in accordance with the methods outlined by Beard and Bulletin No. 17B (References 1 and 2). Flows on the Guyandotte River have been modified by R. D. Bailey Lake and Dam Project since February 1980.

A summary of the drainage area-peak discharge relationships for the Guyandotte River and Mud River is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
GUYANDOTTE RIVER					
At confluence with Ohio River	1,679	24,500	34,500	39,400	50,700
Above U. S. Route 60	1,308	21,400	32,400	36,400	49,500
MUD RIVER					
At confluence with Guyandotte River	359.0	13,200	18,000	20,000	24,800
Upstream of Prichard Road	330.4	12,800	17,400	19,200	23,600
Upstream of confluence with Mill Creek	299.6	12,300	16,600	18,400	22,700
Upstream of State Route 25	256.0	11,200	15,800	17,800	22,900

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections are located at regular intervals along the stream length and at significant changes in ground relief and land use or land cover. Cross sections were obtained from field measurements supplemented with topographic maps at scales of 1:2,400 and 1:7,200 with contour intervals of 5 feet (References 3 and 4). All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected

cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 5). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

The starting water-surface elevations for the Guyandotte River were taken from the Flood Insurance Study for the unincorporated areas of Cabell County (Reference 6). In that study, the starting elevations were taken from the confluence with the Ohio River. For the Mud River, the starting water-surface elevations were calculated using the slope/area method.

Roughness coefficients (Manning's "n") depend on factors such as the type and amount of vegetation, channel configuration, and water depth. Field inspection at each cross section provided estimated values. In conjunction with this approach, known roughness factors for comparable streams in adjacent watersheds were considered. The channel "n" values for the Guyandotte River ranged from 0.040-0.045, and the overbank "n" values ranged from 0.045-0.070. For the Mud River, the channel "n" values ranged from 0.035 to 0.065, and the overbank "n" values ranged from 0.040 to 0.080.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent

annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at scales of 1:2,400 and 1:7,200 with contour intervals of 5 feet (References 3 and 4).

For the streams studied by approximate methods, the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Map for the Village of Barboursville (Reference 7).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections.

Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodway is shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for the Guyandotte and Mud Rivers extend beyond the corporate limits.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

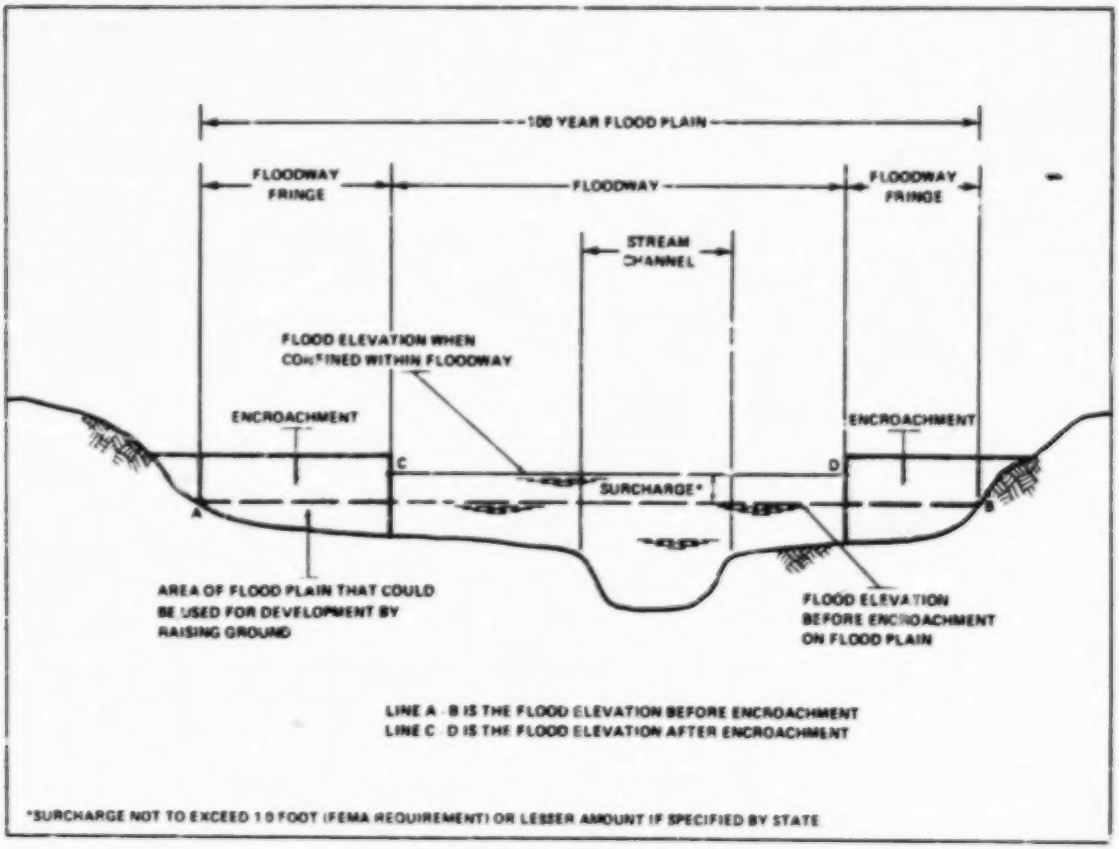
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

Figure 2 **FLOODWAY SCHEMATIC**

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Guyandotte River								
A	7.102	292/30	7,861	4.6	555.0	548.6[3]	548.6	0.0
B	7.303	357/160	8,211	4.4	555.0	548.9[3]	548.9	0.0
C	7.456	280/40	7,405	4.9	555.0	549.1[3]	549.1	0.0
D	7.483	296/60	6,898	5.3	555.0	549.2[3]	549.2	0.0
E	7.745	364/54	8,665	4.2	555.0	549.8[3]	549.8	0.0

[1]Miles above confluence with Ohio River

[2]Width/width within corporate limits

[3]Elevation computed without consideration of backwater effects from Ohio River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BARBOURSVILLE, WV

(CABELL CO.)

FLOODWAY DATA

GUYANDOTTE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Mud River								
A	0.028	736/110	7,144	2.8	555.0	550.0[3]	550.9	0.9
B	0.075	303/52	7,658	2.6	555.0	550.2[3]	551.1	0.9
C	0.238	305/25	8,132	2.5	555.0	550.3[3]	551.2	0.9
D	0.285	274/124	6,545	3.1	555.0	550.4[3]	551.3	0.9
E	0.454	622/55	12,614	1.6	555.0	550.7[3]	551.6	0.9
F	0.686	1343/1200	18,913	1.1	555.0	550.8[3]	551.7	0.9
G	0.890	1291/1135	17,108	1.2	555.0	550.9[3]	551.7	0.8
H	1.239	1251/40	20,072	1.0	555.0	550.9[3]	551.8	0.9

[1]Miles above confluence with Guyandotte River

[2]Width/width within corporate limits

[3]Elevation computed without consideration of backwater effects from Guyandotte River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BARBOURSVILLE, WV

(CABELL CO.)

FLOODWAY DATA

MUD RIVER

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in Table 2 for certain downstream cross section of the Guyandotte River and the Mud River are lower than the regulatory flood elevations in that area, which must take into account the 100-year flooding due to backwater from other sources.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

A Flood Insurance Study for the unincorporated areas of Cabell County is currently being prepared (Reference 6). The results of that study will be in exact agreement with the results of this study.

Due to its more detailed nature, this Flood Insurance Study supersedes the Flood Hazard Boundary Map for the Village of Barboursville (Reference 7).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Leo R. Beard, Statistical Methods in Hydrology, Sacramento, California, U. S. Army Corps of Engineers, January 1962.

2. U. S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, "Guidelines for Determining Flood Flow Frequency," Bulletin 17B, Reston, Virginia, Revised September 1981.

3. L. Robert Kimball & Associates, Topographic Maps compiled from aerial photographs, Ohio Coordinate System, South Zone, Scale 1:2,400, Contour Interval 5 Feet: Barboursville, West Virginia, April 1984.

4. U. S. Army Corps of Engineers, Huntington District, Ohio River Flood Plain, Greenup Pool Reach, Sandy Hook Datum, Scale 1:7,200, Contour Interval 5 Feet: Sheets 25, 26, 30, 31, 32, 33, 34; 1958.

5. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, September 1982.

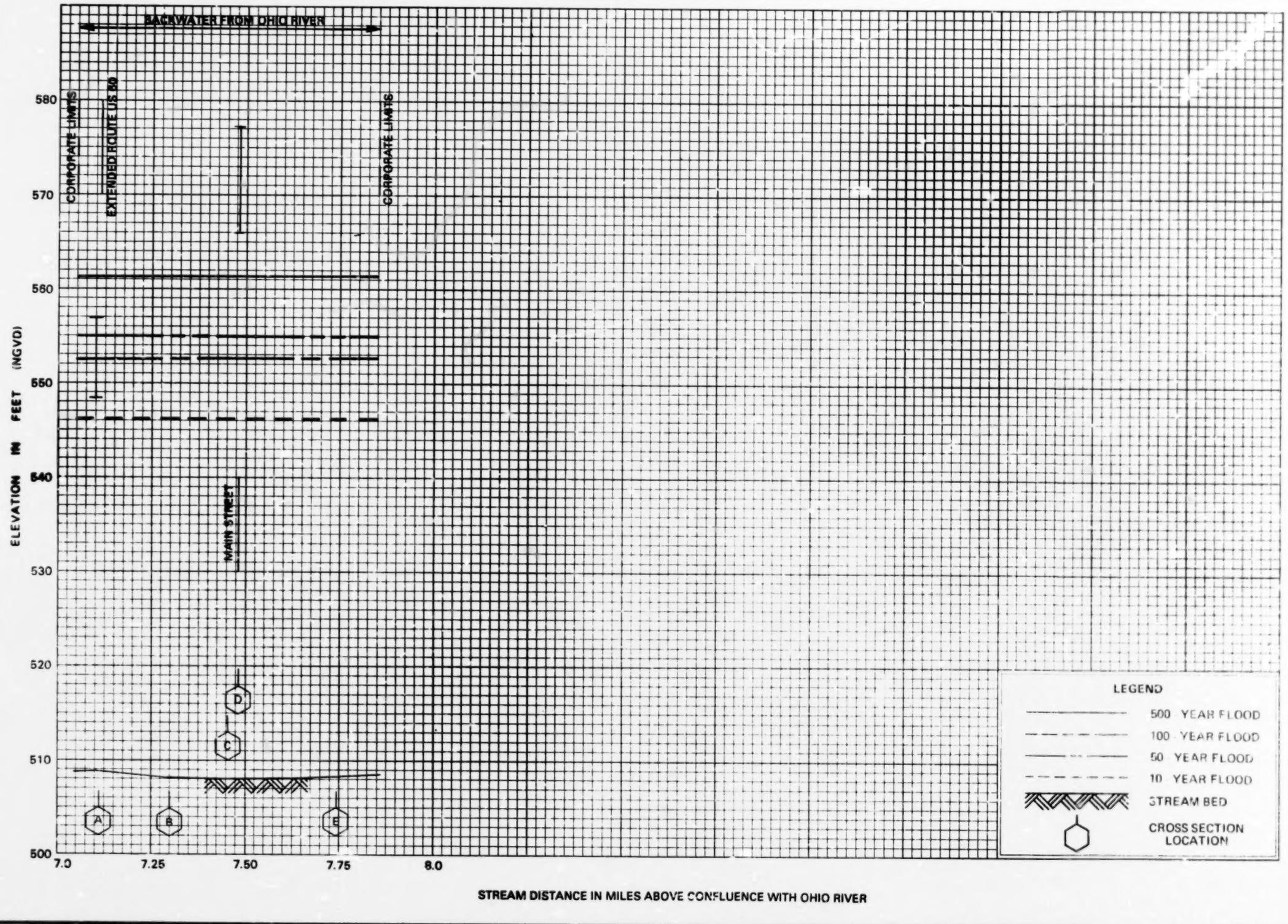
6. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Cabell County, West Virginia (Unpublished).

7. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Barboursville, Cabell County, West Virginia, October 24, 1975.

U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, contour Interval 20 Feet: Barboursville, Ohio-West Virginia, 1968, Photorevised 1975.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (Feet NGVD)	Description of Location
RM 1	582.568	USC&GS disk stamped S 38 1935, set in concrete post, 210 feet northeast of northwest corner of CSX Railway Station, 51 feet north of north rail of main track, and 18 feet south of south rail of spur track.
RM 2	572.053	USC&GS disk set in southwest abutment of CSX Railway Bridge No. 495.2 over U. S. Route 60.



FLOOD PROFILES

GUYANDOTTE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BARBOURSVILLE, WV

(CABELL CO.)

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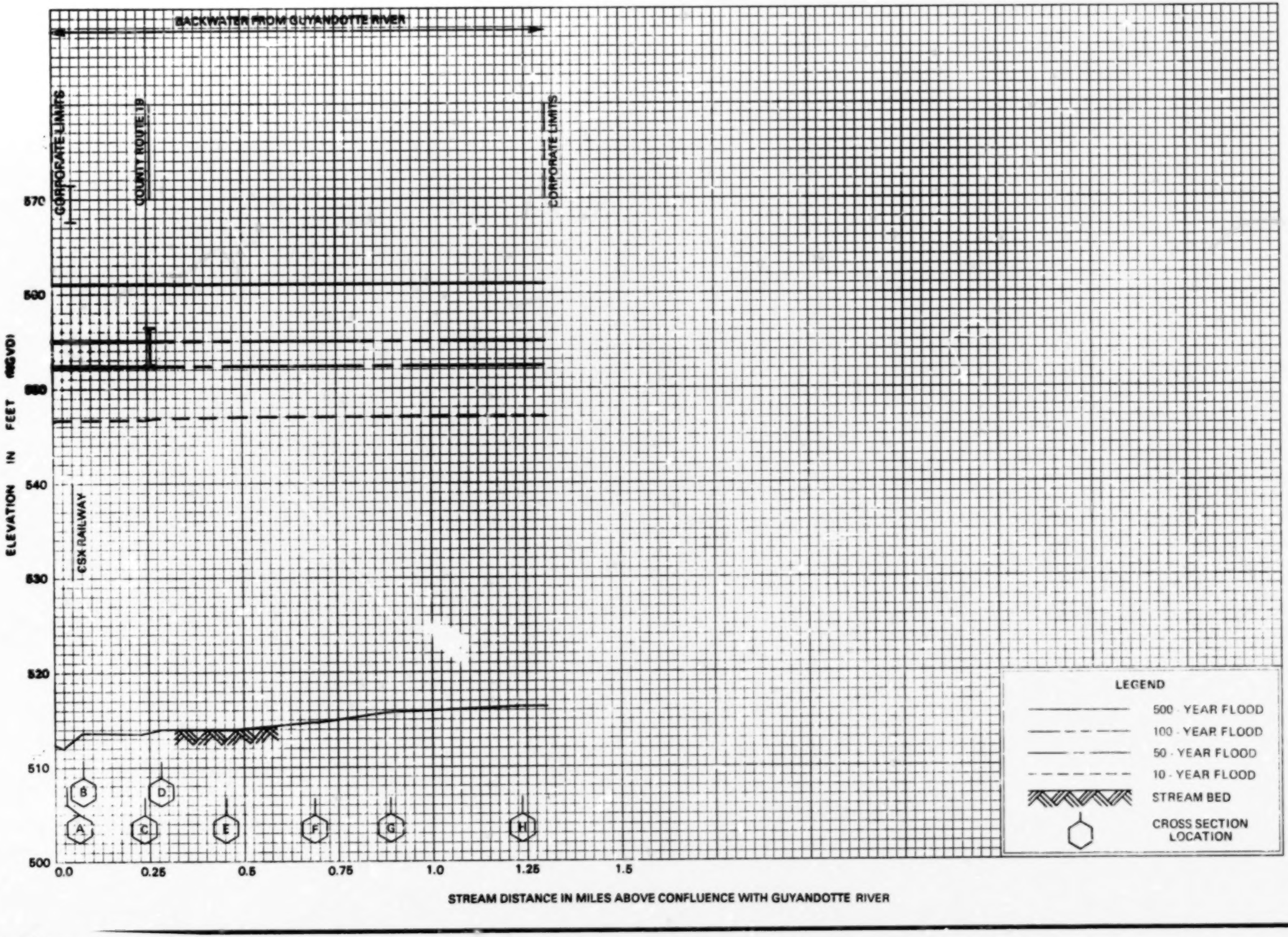

FLOOD PROFILES

MUD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

VILLAGE OF BARBOURSVILLE, WV
(CABELL CO.)

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